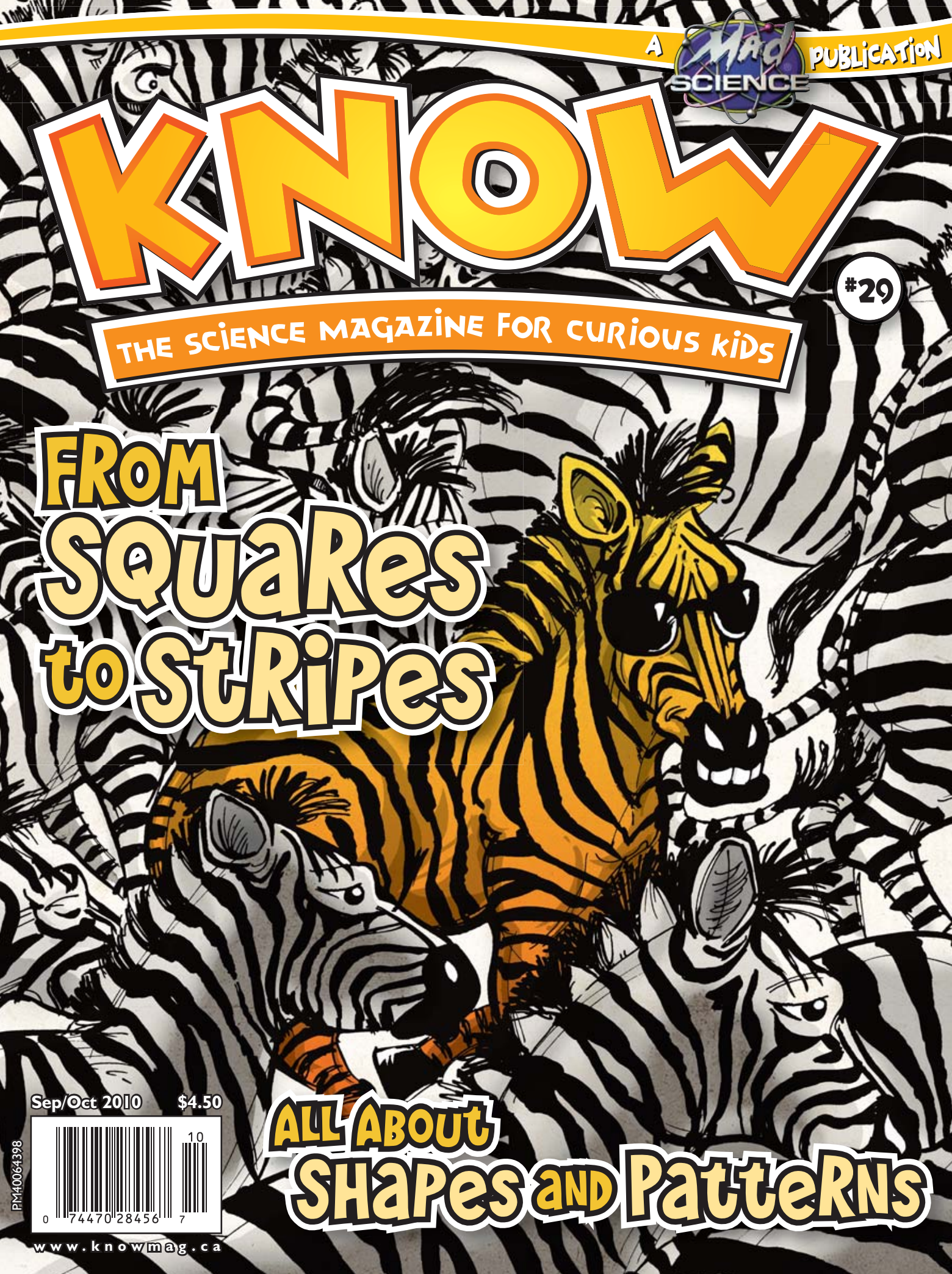
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#29
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FROM SQUARES TO STRIPES
ALL ABOUT SHAPES AND PATTERNS
Sep/Oct 2010 $4.50
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Number 29, September/October 2010

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INSIDE KNOW

SEP/OCT 2010 ISSUE 29 WWW.KNOWMAG.CA

DEPARTMENTS

Where are the pets hidden in this issue?

ABOUT THE COVER

Mike Cope is a cartoonist from Stoney Creek, Ontario. He's had many creative jobs, but Mike thinks working as a zebra stripe painter at the zoo would be a lot of fun!

Courtesy Paul Hamilton

A See-Through Frog

Hey, froggy, your guts are showing! Scientists from Reptile and Amphibian Ecology International call this stunning creature the glass frog. The frog's chest is transparent — you can see right through the skin to its liver, lungs, and beating heart! The glass frog was photographed in the steamy jungle of Ecuador. It was found along with several new species of "rain frogs," but it's no surprise this see-through frog is getting most of the attention.

The glass frog is also unusual because it lays its eggs in shrubs or trees hanging over creeks, streams, or small rivers. When the glass frog's eggs hatch, tadpoles drop into the water and swim away. "Flying" tadpoles? See-through bellies? What else will scientists find in the tropical jungles?

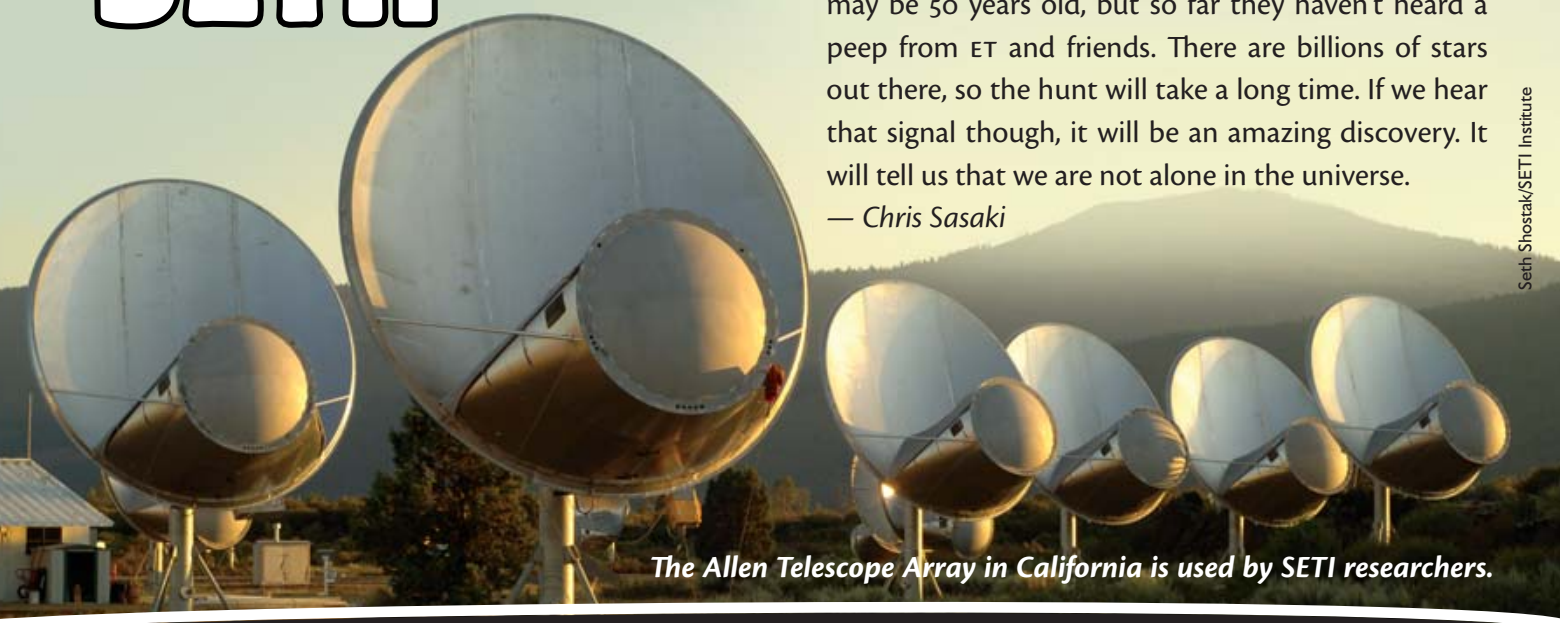
— *Tara Harte*

Happy 50th Birthday, SETI!

Fifty years ago, scientists began to search for intelligent life on planets beyond our solar system. But they didn't use spaceships. Instead, scientists scanned space using powerful antennas called radio telescopes. They thought that if aliens were out there, they might be making radio signals similar to ours.

The search by the SETI Institute (Search for Extraterrestrial Intelligence) is still going on today. SETI may be 50 years old, but so far they haven't heard a peep from ET and friends. There are billions of stars out there, so the hunt will take a long time. If we hear that signal though, it will be an amazing discovery. It will tell us that we are not alone in the universe.

— *Chris Sasaki*



Seth Shostak/SETI Institute

The Allen Telescope Array in California is used by SETI researchers.

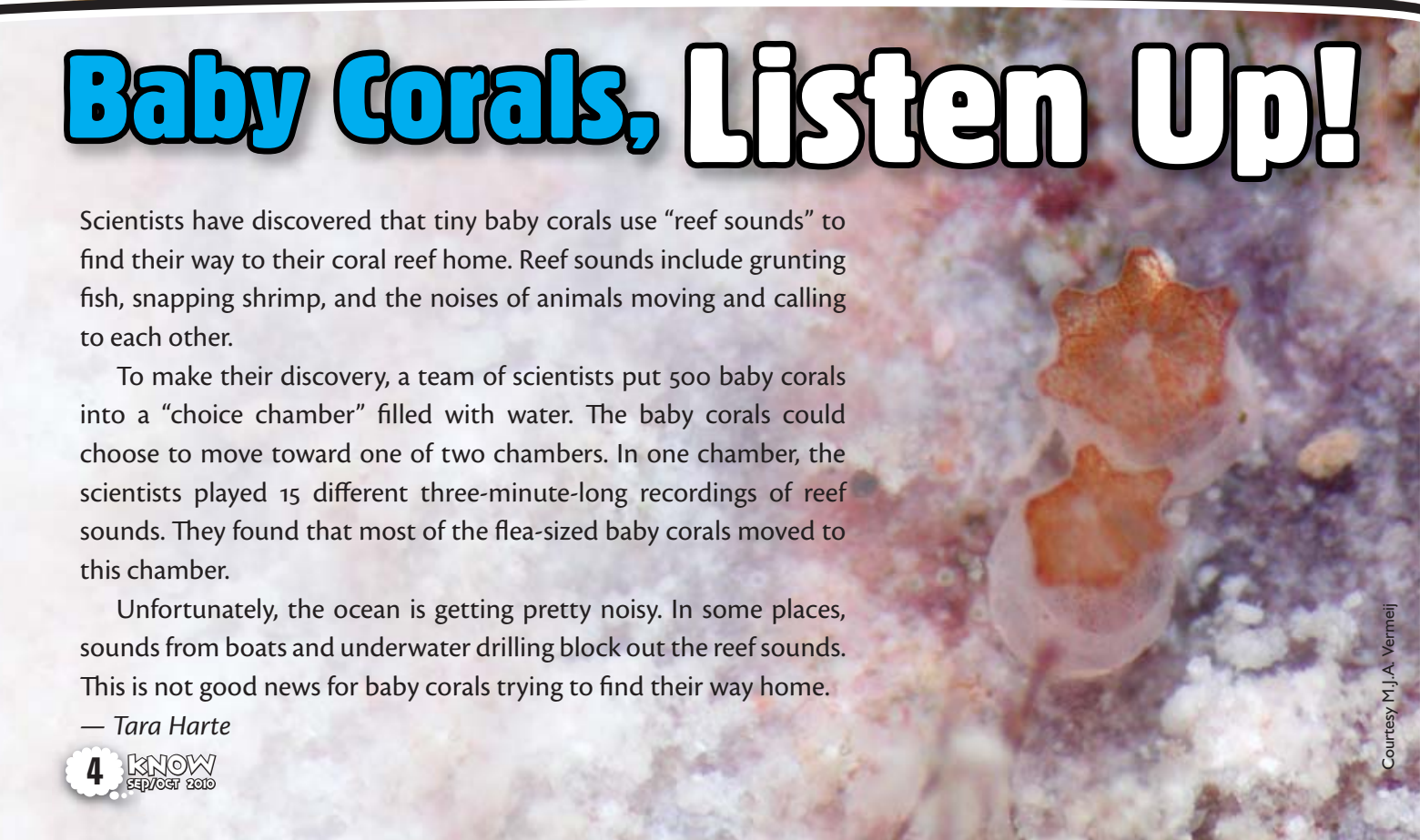
Baby Corals, Listen Up!

Scientists have discovered that tiny baby corals use "reef sounds" to find their way to their coral reef home. Reef sounds include grunting fish, snapping shrimp, and the noises of animals moving and calling to each other.

To make their discovery, a team of scientists put 500 baby corals into a "choice chamber" filled with water. The baby corals could choose to move toward one of two chambers. In one chamber, the scientists played 15 different three-minute-long recordings of reef sounds. They found that most of the flea-sized baby corals moved to this chamber.

Unfortunately, the ocean is getting pretty noisy. In some places, sounds from boats and underwater drilling block out the reef sounds. This is not good news for baby corals trying to find their way home.

— *Tara Harte*



Courtesy M.J.A. Vermeij

Ancient Eggs

A team of scientists has discovered that people who lived thousands of years ago weren't so different from us — they liked to decorate eggs. But these eggs weren't chicken eggs and they weren't for Easter.

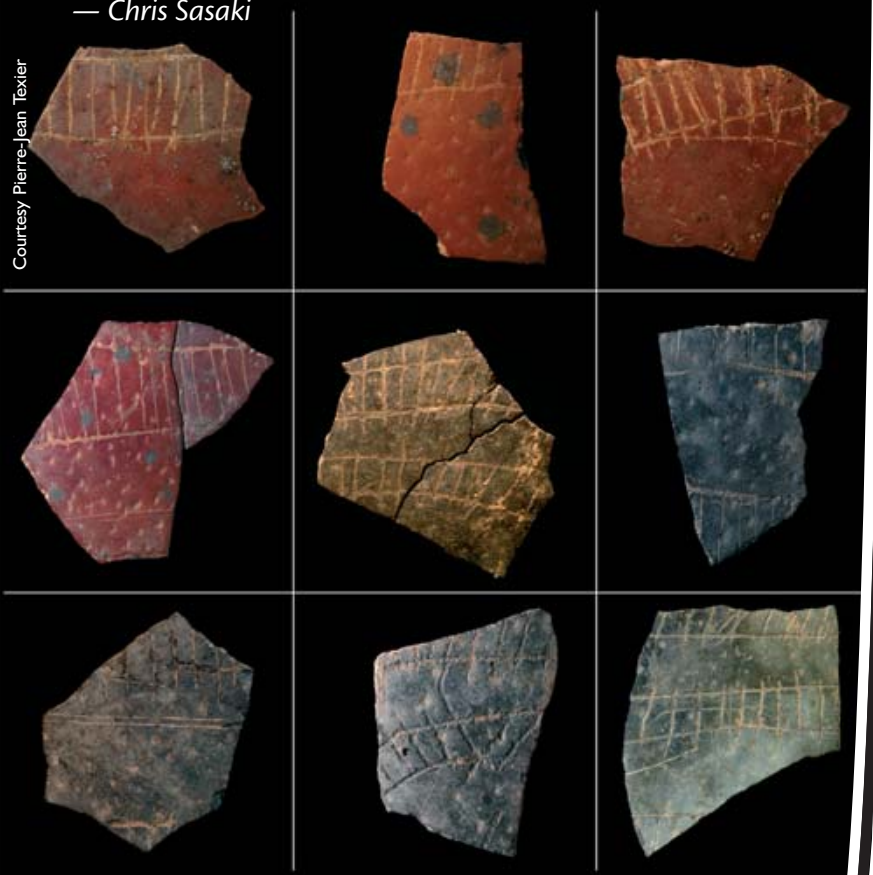
The scientists found pieces of 60,000-year-old ostrich eggs in a South African cave. Before the shells broke, they were probably used to carry water. (An ostrich egg holds about 20 times more water than a chicken egg.) The team was more interested in what was *on* the shells than what was in them though.

The eggshell fragments were covered in different markings that looked like train tracks and rows of straight lines. The scientists don't think the markings were for decoration. Whoever scratched them into the eggshell containers was saying, "These belong to us." Different groups of people made different marks on their eggshells.

This behaviour is not so different from what we do today. When you write your name or draw your favorite doodle on your belongings, you're saying, "These things belong to me!" If you had an ostrich egg, what would you draw on it?

— *Chris Sasaki*

Sam Logan

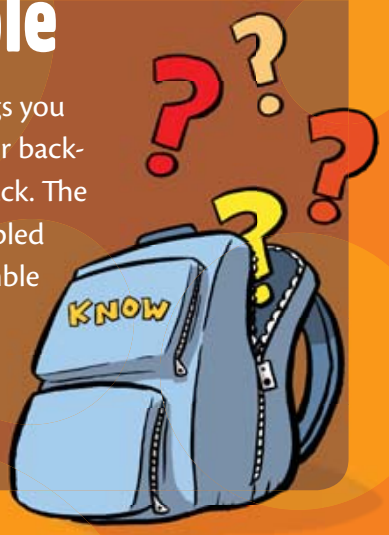


Courtesy Pierre-Jean Texier

Mind Games

Back-to-School Scramble

Here are six things you might find in your back-to-school backpack. The letters are scrambled though. Unscramble them so you can make your list! We've given you a few clues.



1. L P C E I N
_ _ _ _ _ L

2. H U L C N
_ U _ _ _

3. B K N O O T O E
_ _ _ _ _ O O _

4. S E E R A R
_ _ A _ _ _

5. Y C A N O R S
C _ _ _ _ _ _

Answers on page 31.

The T-shirt Print Shop

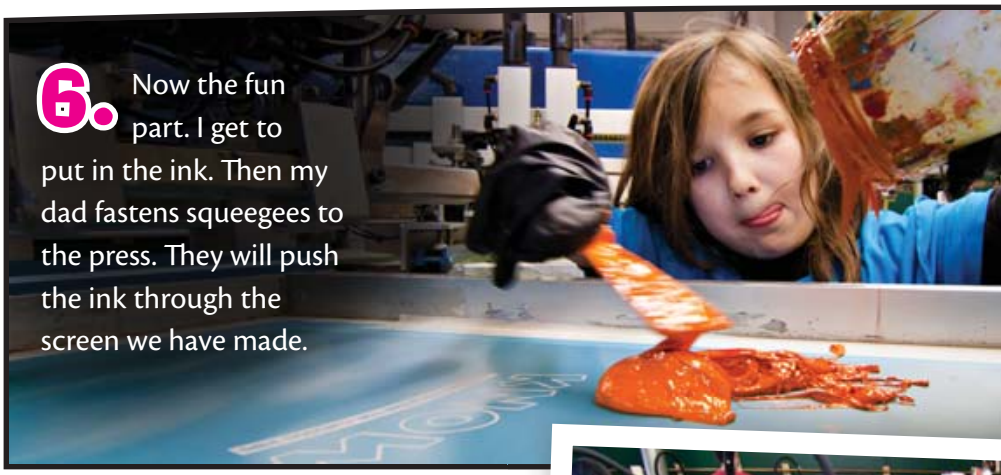
by Abby and Matt Pierrot
Photos by Ashton Cummings

1. Hi, I'm Abby. My dad has a t-shirt printing shop and gets to print all kinds of cool things on t-shirts. When I heard that he was going to make a shirt for *KNOW*, I asked if I could help.

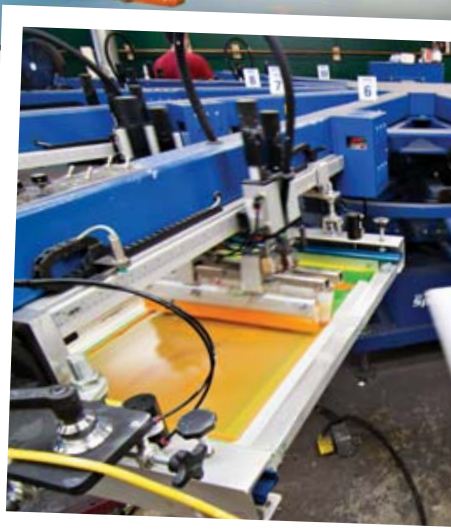
2. The first step of the printing process happens on the computer. We separate all the colors. We will put them back together on the t-shirt one at a time. We print each of the colors onto a clear piece of plastic called a film. Do you wonder where the color is? Just wait.

5. This is a picture of the pressman, Adam, putting the screen on the printing press. He has to put it in the right place so that all the colors print only where they are supposed to.

6. Now the fun part. I get to put in the ink. Then my dad fastens squeegees to the press. They will push the ink through the screen we have made.



7. Now we are ready to go. My dad loads t-shirts onto the printing boards and the machine winds them around the press on giant octopus arms. One color is printed at a time. The press goes super fast, stopping underneath each screen long enough for the squeegee to go back and forth. Once the t-shirts make a full circle around the press, it is done.



3. Now we transfer the images from the film to screens. A screen is a mesh stretched across a frame. It is just like the screens on the doors and windows in your home, only the holes are smaller. We coat these screens with emulsion, which is a fancy word for glue.

Can you see the film hiding underneath the green of the mesh? When I turn on the big light under the screen, the black parts of the film block out the light. In these spots we can wash off the emulsion. Everywhere else it becomes hard.

4. Here I am washing a screen. I think it's cool to see the image appear as the unexposed emulsion washes away. When I'm done, we have an exact copy of each of the films.

8. Oops, not quite done! The t-shirts have to be dried first. They come off the press and onto a conveyor belt that takes the t-shirts for a ride into a giant oven. The trip takes about one minute and then the t-shirts drop into a box at the other side. Now they are done!

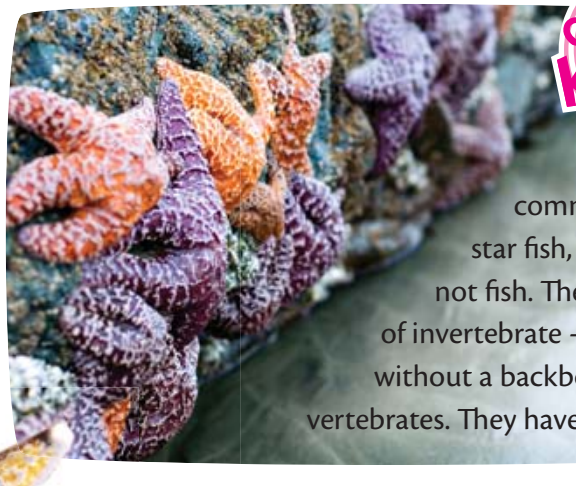
9. Ta-da! Here I am wearing a beautiful *KNOW* t-shirt. It looks great, doesn't it?

Sea Stars

by Raymond Nakamura

Almost 2000 different kinds live in the world's oceans. They can be smaller than the flakes in your breakfast cereal or bigger than a steering wheel. Most have five arms, but a few have up to 40. If they lose an arm, they can grow it back. Fascinating sea stars really are the stars of the sea!

You might find a sea star on a rocky shoreline when the tide is out. Sea stars hide in shadows, out of the sun, rain, and wind, so they won't dry out. Don't try to pull one off the rock though. Sea stars cling to the rock using hundreds of little tube feet so waves don't wash them away. They also use tube feet to move.



Sean Wood

GOOD TO KNOW

Although commonly called star fish, sea stars are not fish. They are a kind of invertebrate — an animal without a backbone. Fish are vertebrates. They have backbones.

Most sea stars are hard or even spiky. This makes them difficult to swallow. It doesn't stop some gulls from trying to gag them down though! Other than gulls, large sea stars have few predators. It's more dangerous when they're small. Sea stars protect themselves with tiny pincers. They pinch enemies and are also used to pick off seaweeds and tiny animals that try to grow on their backs.

If you come across a sea star with a hump in the middle, it is probably in the middle of lunch. Sea stars don't have teeth or jaws so they eat by draping their body around a meal such as a mussel or clam. They grip tight with their tube feet and pull the shells apart. Then they push their stomach *inside* the mussel's shell. Digestive juices break down the mussel tissue, and all that goodness is absorbed through the sea star's stomach.

Re-growing lost arms, eating without teeth, walking on hundreds of feet? Sea stars are full of surprises!

Dale Sanders/All Canada Photos

A leather star is soft and smooth, but smells like garlic. This might make it taste bad.

A WORLD OF SHAPE AND PATTERN

Theme section by Fiona BayRock

Our world is full of shapes and patterns — rectangular windows, round tires, cubes of sugar. Life would be pretty flat if it weren't for all of those shapes! And thank goodness for patterns, too. Patterns put the checker in the checkerboard, the rhythm in our music, and the fun in fabrics.

In this issue, we're taking a closer look at shapes and patterns. After all, it's hip to be a square (and a circle and a triangle)!

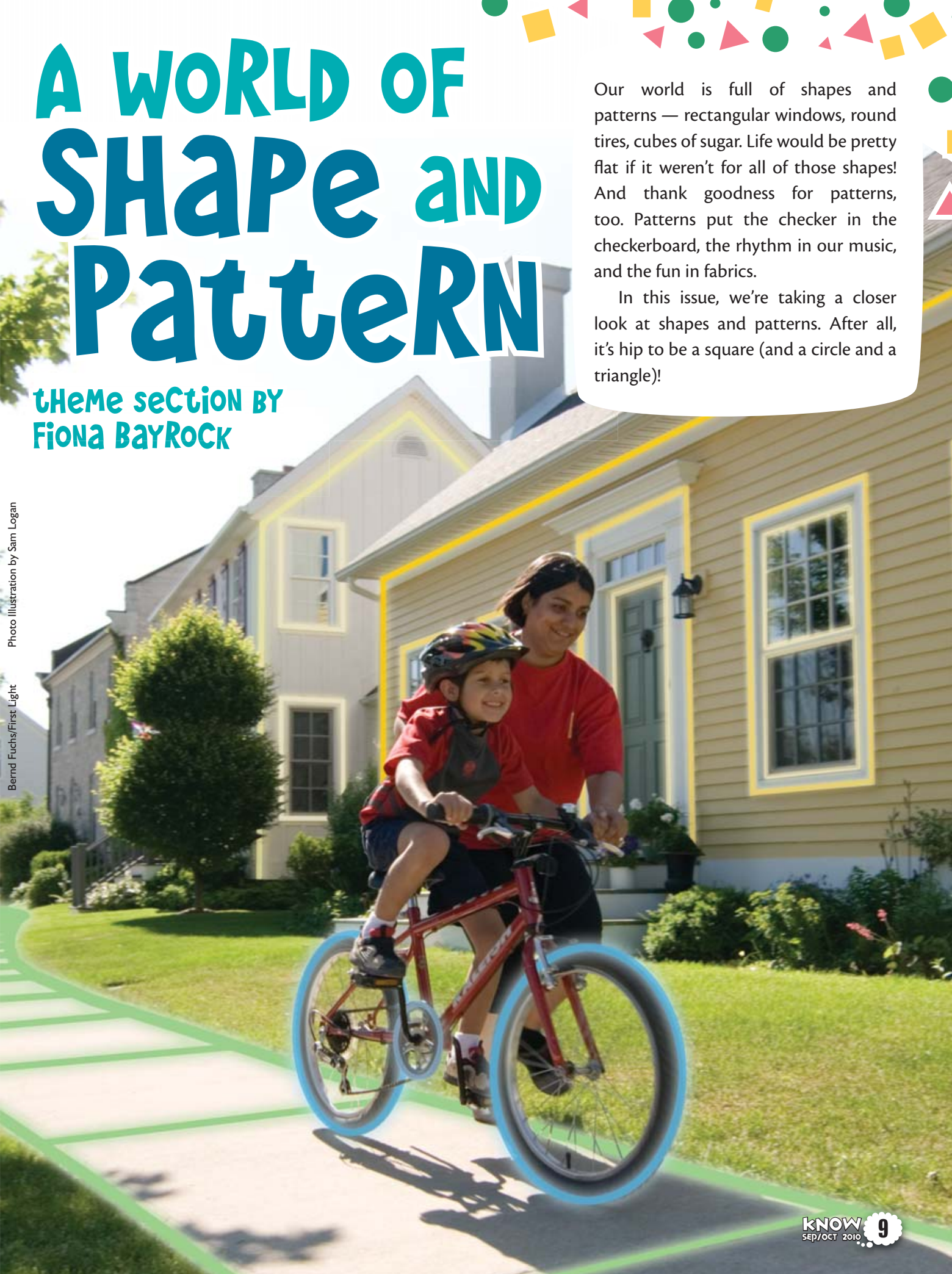


Photo Illustration by Sam Logan
Bernd Fuchs/First Light

Get in Shape!

Look around. What shapes do you see? Squares, rectangles, splats of spilled milk, and soccer balls are all shapes. Our world is full of them.

If you draw a square on a page, you have created a shape that can be measured two ways: length and width. These are its dimensions and the shape is called two-dimensional (2-D).

Two-dimensional shapes made with straight lines are called polygons. The ancient Greeks came up with that one. Polygon means *many angles*. What's your favorite polygon? The triangle? Rectangle? Or maybe the octagon, dodecagon, or icosagon? Whoa! What were those last ones? The names tell you how many sides the shape has.

A few Greek numbers will help. *Octa* = 8, *dodeca* = 12, and *icosa* = 20, so an octagon is an 8-sided polygon, the dodecagon is 12 sided, and the icosagon is 20 sided.

Vast Photography & Productions Studio/First Light

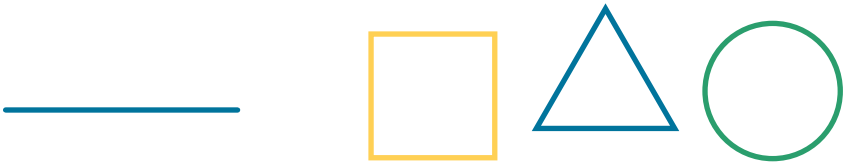
Real Stuff

Most objects around us have length, width, *and* depth. They are three-dimensional (3-D). Some things — you, for example — are made of curves and bumpy parts. Completely round objects, such as bubbles and baseballs, are called spheres. Three-dimensional objects made of smooth polygons perfectly joined together are called polyhedrons. Yup, a word from the Greeks again. It means *many faces* (or sides). So an octahedron has eight faces and

Dan Thornberg

Three Kinds of Ds

D is for dimensional. The three dimensions are length, width, and depth.



1-D
Length

2-D
Length + Width

FUN TO KNOW

The more sides a polygon has, the more it looks like a circle. The more sides a polyhedron has, the more it looks like a sphere.

a dodecahedron has 12 faces.

Polyhedrons can be fun. If you've ever played soccer, then you've kicked around a truncated icosahedron — the ball! It is almost a sphere, but because it is made of polygons, it is a polyhedron instead. It has 20 faces with the pointy bits cut off (truncated) to make it rounder and easier to play with. And hey, next time you need the dice when playing a board game, just ask someone to pass the hexahedrons (those cubes with the dots).

sumnersgraphicsinc

Robert Melkonian

YOU TRY IT!

Sam Logan (2)

Draw a picture of a fish on a piece of paper.

Your fish is 2-D. Want to turn your 2-D fish into a 3-D fish? Trace another copy. Cut out the fish and staple them together leaving a small opening. Scrunch up scrap paper and stuff it in your fish. Voila! Now it's 3-D.

GO, EULER'S FORMULA!

In the 1700s, a famous mathematician named Leonhard Euler [OY-ler] noticed something interesting about polyhedrons. If you add the number of faces (flat sides) to the number of corners and subtract the number of edges, the answer is always two. For example:

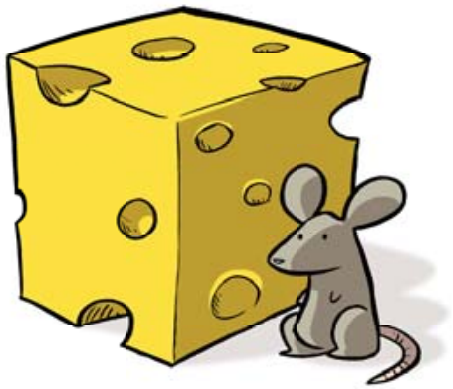
TETRAHEDRON:

4 faces + 4 corners - 6 edges = 2

OCTAHEDRON:

8 faces + 6 corners - 12 edges = 2

Try it with a cube:



__ faces + __ corners - __ edges = __

Check your answer on page 31.

SHAPE SAYINGS

SIDES	POLYGONS (2-D)	POLYHEDRONS (3-D)
tetra = 4	tetragon*	tetrahedron
penta = 5	pentagon	pentahedron
hexa = 6	hexagon	hexahedron
octa = 8	octagon	octahedron
deca = 10	decagon	decahedron

(*These are commonly called quadrilaterals. *Quad* means four.)

3-D

LENGTH + WIDTH + DEPTH

Shapes on the Job

Don Bayley

Riding a bicycle with square tires instead of circular would be slow and frustrating. And playing basketball with a pyramid-shaped "ball?" Just silly. Everything in our world — natural objects and those made by humans — has a particular shape. What shapes your world?

Circles and Spheres

If you want something to roll or spin, circles or spheres make the most sense. They don't have any angles or edges to interrupt a smooth roll. Wheels, gears, balls, hula hoops...what other circles or spheres can you think of?

Spheres are special shapes because they have a small surface area but can hold a large volume. (Think of an orange. The skin is the surface area. Everything inside the skin is the volume.) Bubbles and balloons are spheres and so is the planet we live on!

Good to Know

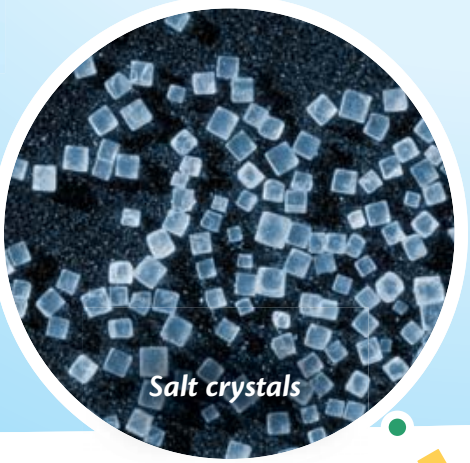
If you are cold, you might curl up in a ball. This makes you like a sphere. For their volume (the stuff inside), spheres have very little surface area. This means that they lose heat slower than other shapes. Now you know why a teapot is round like a sphere!

Squares, Rectangles, Cubes, and Blocks

Most buildings are full of squares and rectangles. Just think of windows, walls, and doors. These shapes are easy to measure and piece together.

Cubes, like blocks or dice, fit together without any wasted space. And boxes are easy to stack, store, and move by truck or plane.

You find cubes in some surprising places. If you looked at salt crystals under a magnifying glass, you would see they are cubes, too.



Salt crystals

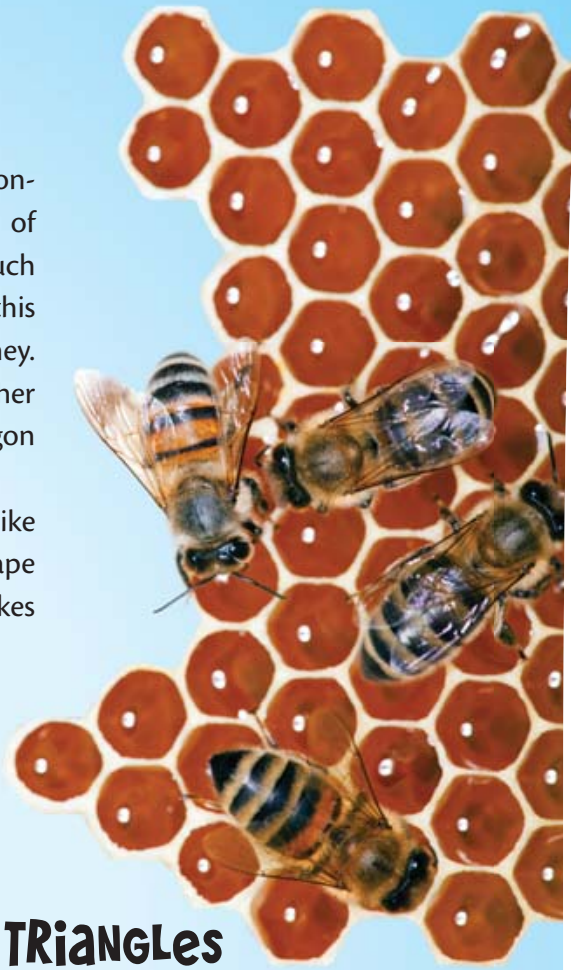
Cezar Serbanescu

Hexagons

Bees store honey and eggs in hexagon-shaped (six-sided) spaces made of wax. Hexagons don't take as much wax to build as other shapes. And this shape allows bees to store more honey. Regular hexagons also fit together without any gaps. (In a regular hexagon all six sides are the same length.)

Some snowflake crystals are like needles or rods, but thanks to the shape of water molecules, most snowflakes have six sides.

proxyminder



Jamie Leite

Triangles

When it comes to shapes, triangles are the superheroes. They stay strong under weights that would bend, warp, or crumple other shapes. That's because to change a triangle's shape you have to shorten or lengthen one of its sides. So once a triangle is built, it's super strong.

Triangles can also come to the rescue of other shapes. Add support beams to divide any shape into triangles and it will be much stronger. You will find oodles of triangles in large structures such as towers and bridges.

Sam Logan

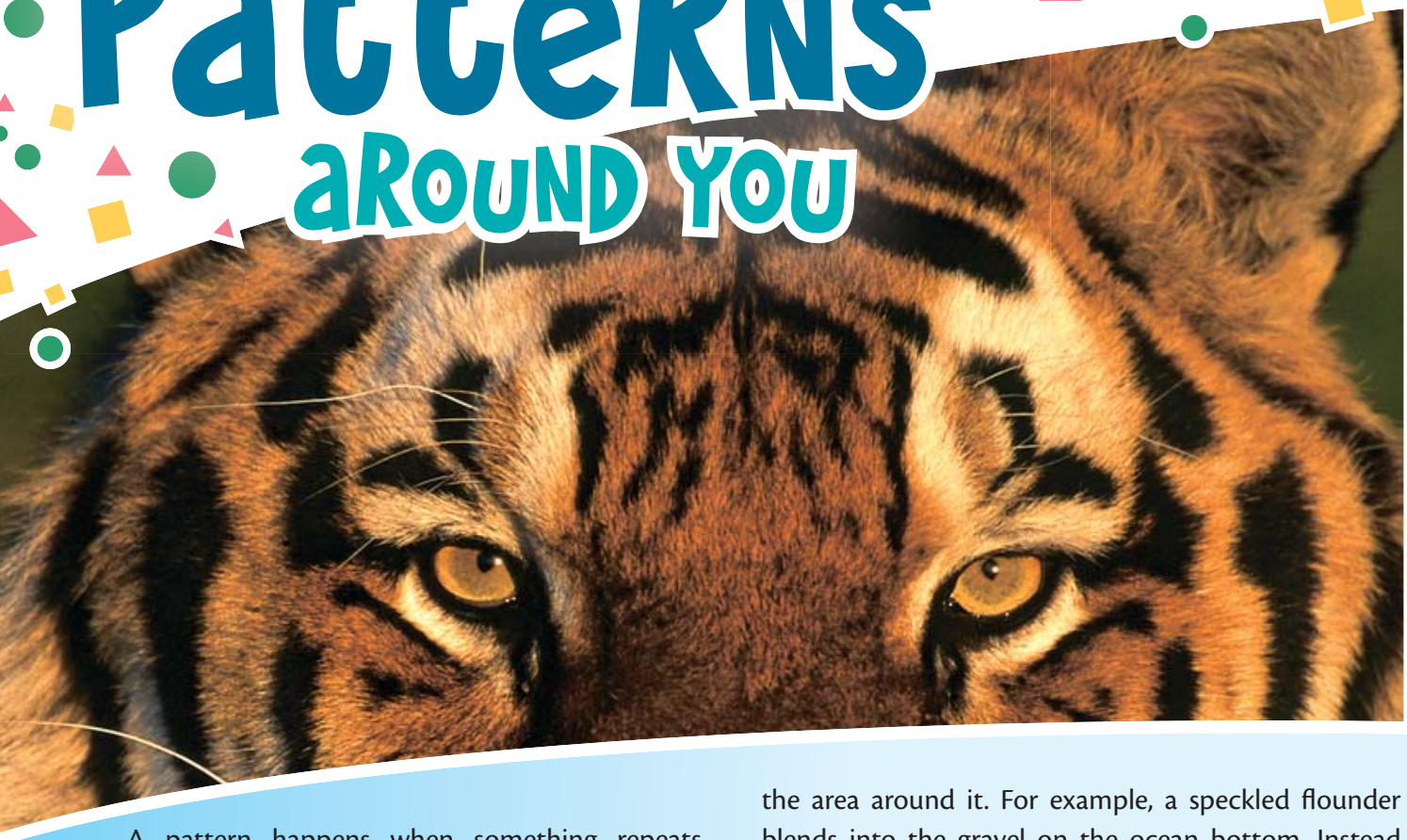
Greek Shape Smarts

Boy, did those ancient Greeks know their shapes. They pretty much invented geometry, a kind of math all about shapes and the space they use. They worked with lines and circles to learn many important things about the world. For example, a Greek mathematician named Eratosthenes [air-uh-toss-thuh-neez] studied and measured circles to prove the Earth is a sphere. He also figured out the distance around the Earth. And he did it more than 2000 years ago without a calculator or computer!

FUN TO KNOW

Traffic signs are different shapes so drivers can recognize them from far away. A stop sign is the only octagon. Triangular signs warn drivers to take extra care. Signs with street names and information about which way to go are usually rectangles.

PatteRNs aRound You



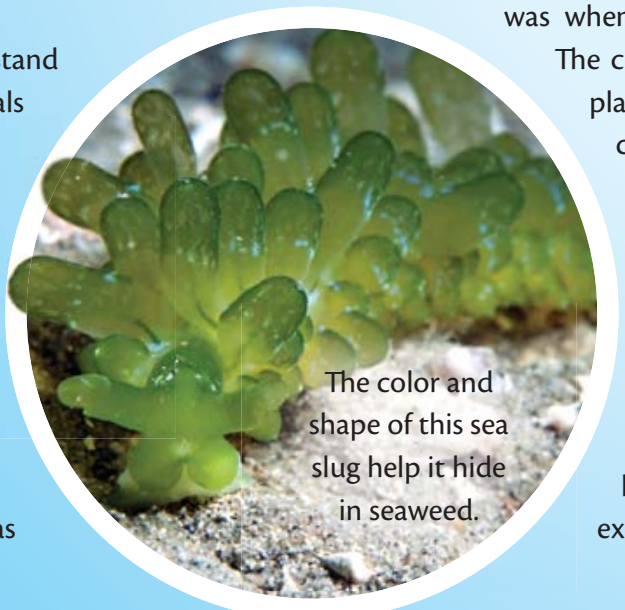
Thomas Kitchin & Victoria Hurst/First Light

A pattern happens when something repeats. Numbers, sounds, words, shapes, and many other things form patterns. You can find patterns that go in one direction, such as beads on a string or numbers in a series. You can also find patterns that go out in many directions at once, like floor tiles or leopard spots. Patterns make it easier to find things, remember things, and know what to expect next.

Stripes and Spots

Scientists don't completely understand why zebras, tigers, and other animals have such spectacular stripes. Or why leopards and giraffes have spot patterns. Some scientists think the patterns of fur and skin might help keep the animals cool. They could also help animals recognize each other or hide from predators.

Hiding from predators is easier if an animal is the same pattern as the area around it. For example, a speckled flounder blends into the gravel on the ocean bottom. Instead of hiding, some animals such as wasps, skunks, and the poisonous blue-ringed octopus have patterns that say, "WARNING! WARNING! Do NOT mess with me!"



The color and shape of this sea slug help it hide in seaweed.

James Peake

Follow the Clues

Scientists look for patterns because they give clues about how nature works. For example, snowflake patterns tell us how cold and wet the air was when the snow crystals formed. The changing pattern of stars and planets in the night sky gives us clues about how Earth and other planets move. And by looking at sand dune patterns, we can figure out how air and water flow, and how plant roots keep sand and soil in place. Observing and understanding patterns help scientists (and you, too) explain the world around us.

Bernard Hallet

ROCK ON!

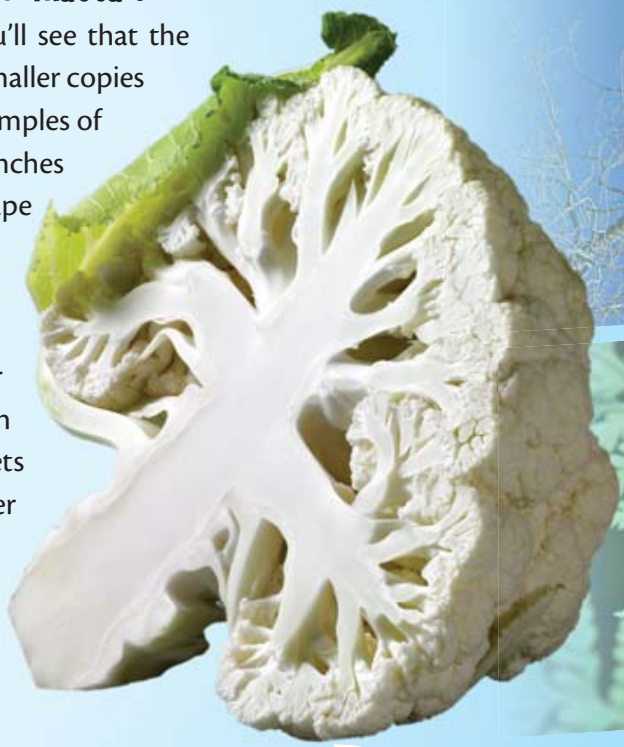
In Spitsbergen, Norway, hundreds of years of the ground freezing and thawing has created stone circles (shown here). Each winter, soil near the surface expands (takes up more space) because water in the soil freezes. This pushes the stones up.

A pattern of hexagonal rocks in Ireland is called The Giant's Causeway because it looks like stepping stones for a giant. The hexagons formed when hot liquid rock pushed up from underground and cooled quickly.

FRACTALS FRACTALS FRACTALS

Look closely at a tree and you'll see that the branches and twigs look like smaller copies of the whole tree. They are examples of fractals, smaller copies (the branches and twigs) of the original shape (the tree). Cauliflower and broccoli are made of tree-like bunches called florets. Larger florets are made of smaller florets, which are made of even smaller florets. The little florets look like copies of the larger ones. Look for fractal patterns in ferns, clouds, mountains, and lightning.

Yann Poirier



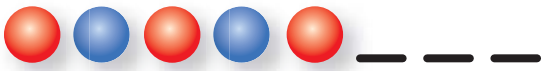
Prill Mediendesign & Fotografie

Brandon Laufenberg

YOU TRY IT!

FIND THE PATTERNS

What comes next?



5 10 15 20 25 30 _ _ _

1 2 2 3 3 3 4 4 4 4 5 _ _ _ _ _

Turn to page 31 for the answers.

Fibonacci Fun

Fibo-who? Fibonacci [fib-oh-NAH-chee], or Leonardo of Pisa, was an Italian mathematician. He was the first person to write about an unusual sequence of numbers. It starts with **0, 1.** To get the next number in the sequence, add them together 0 + 1 = 1. Now the sequence is **0, 1, 1.**

Keep adding the last two numbers to get the next number in the pattern. So, 1 + 1 = 2 and the sequence is **0, 1, 1, 2.**

Then add the last two numbers again: 1 + 2 = 3.

If you keep doing the math, the Fibonacci sequence looks like this:
0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, and so on.

What's unusual is that the numbers in this pattern show up in nature in interesting ways.

Flowers

Most flowers have a Fibonacci number of petals.

Daisy: 34

George Peters

You Try It!

Count the petals on as many flowers as you can. Do most of them have a Fibonacci number of petals? As flowers age they lose petals, so choose fresh flowers.

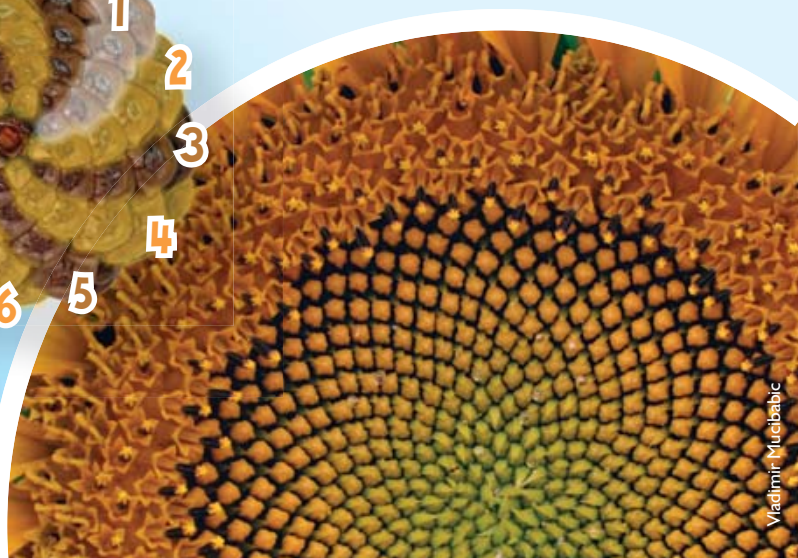
Tree Cones

Count the spirals. There are 8 in one direction and 13 in the other. Other kinds of cones have 3 and 5 spirals or 5 and 8 spirals. All Fibonacci!

Seeds

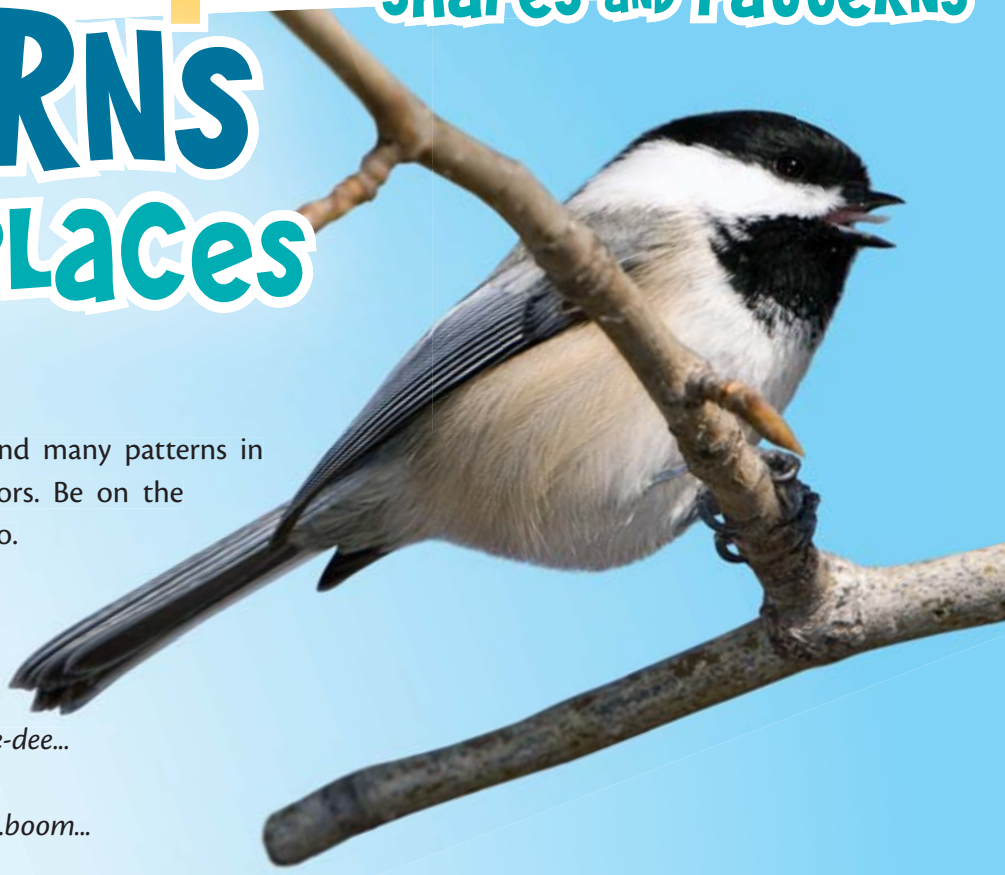
Seeds often form a Fibonacci number of spirals. Sunflower seeds are arranged in spirals going to the right and spirals going to the left. The number of spirals in each direction is a Fibonacci number. Different kinds of sunflowers have different numbers. The pairs might be 34 and 55, or 55 and 89, or 89 and 144. Notice the numbers in each pair are next to each other in the Fibonacci sequence.

David Garrison



Vladimir Mucibabic

PATTERNS IN MANY PLACES



Laura Hart

Wallpaper patterns, quilt patterns, and many patterns in nature are all about shapes and colors. Be on the lookout for other kinds of patterns, too.

Listen to That

Birds sing in patterns —

chick-a-dee-dee-dee...chick-a-dee-dee-dee...

Drummers drum in patterns —

boom-tappa-tap...boom-tappa-tap...boom...

Your heart beats in a pattern —

lubDUB, lubDUB, lubDUB...

Your heart beats faster when you play sports and slower when you rest. Your heartbeat pattern can also tell doctors how healthy you are.

photovideostock

Patterns on the Move

Animals walk in patterns:

People walk

Left, right, left, right, left, right

Dogs and elephants walk

back right, front right, back left, front left, back right

Camels walk

Left-left, right-right, left-left, right-right.

Birds fly in patterns. Gulls and barn owls flap their wings slowly while looking for food below. Cormorants speeding over the ocean are fast flappers. Other birds flap and rest, flap and rest.

Emil Jacobsen

Look for Patterns...

in poetry, knitting, weaving, clouds, the garden, the bottom of your shoe, fences, telephone poles, feathers, snowdrifts, spider webs, peoples' habits, musical instruments, house numbers, your day... and everywhere!

KNOW IT ALLS

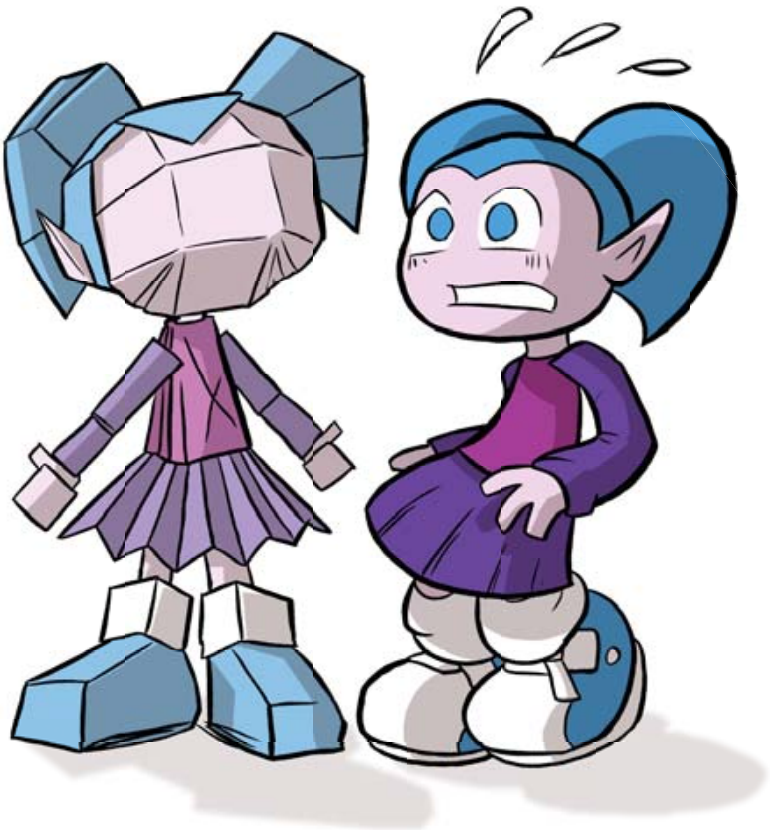
We don't really know it all. But we sure like to find it all out! Like scientists, we watch the world and wonder. Then we try to find the answers to our what, where, why, and how questions.

WHAT IS ORIGAMI?

Take a square sheet of paper, fold it this way and that to shape it into a bird or a box or one of hundreds of other designs. That's origami, the Japanese art of paper folding.

That sounds pretty simple, but many origami shapes take dozens of steps all created without using glue or making any cuts. The artist folds and shapes the paper with moves like valleys, mountains, pleats, and reverse folds. Most origami art is quite small, but some origami artists can make life-size — or even larger than life-size — sculptures.

Origami has links to math and science, too. Computer and math programs can help solve design problems for origami artists. And the folding techniques used in origami have helped engineers figure out how to design air bags. Air bags must inflate quickly without breaking and they need to be folded into a very small space.



Sam Logan (4)

WHAT IS TARTAN?

Fabric that tells a story! A tartan is created from woven patterns of threads. The threads go across and up and down and different colors create different patterns. (Sometimes people call tartan "plaid.")

For centuries, tartans have been made in Scotland. Different weavers created their own tartans using different weaving patterns and colors of wool. At first, people just chose the tartans they liked for their kilts and other clothing. About 200 years ago, certain clans, or families, chose special tartans. In Canada, each province has its own tartan, too.

SHAPE UP!

BY CINDY BREEDLOVE

Circle sinking, daylight fading
Exercisers are parading.

Here we go around the block,
out for a rectangle walk.

Squares behind and squares ahead,
We are being sidewalk led.

Tent triangles in one yard
have a barking dog as guard.

Diamond eyes gleam in the night.
Cat is crouching out of sight.

Stopping at red octagon,
Have a stretch and then a yawn.

Bats swoop oval loops about.
Time for home, we're all worn out.

Walking quickly, heart pumps fast
See our home ahead at last.

Stars shine bright in heaven's deep.
All we want right now is sleep.

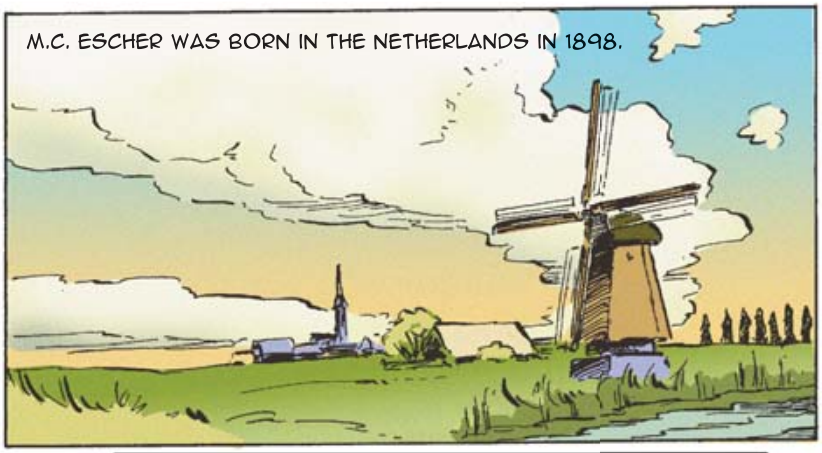
On the lawn a square of light,
Flip of switch, it's gone.
Good night!

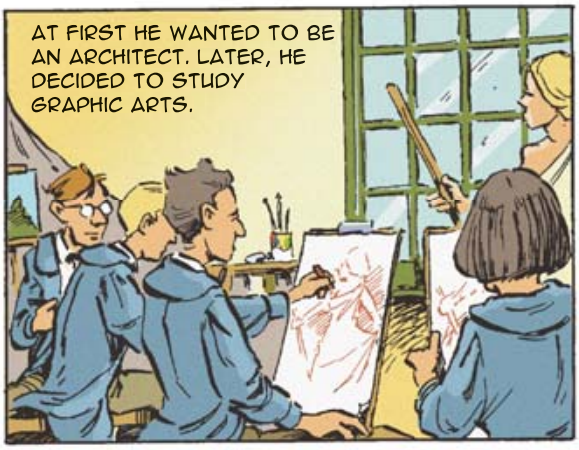
Steve Attoe

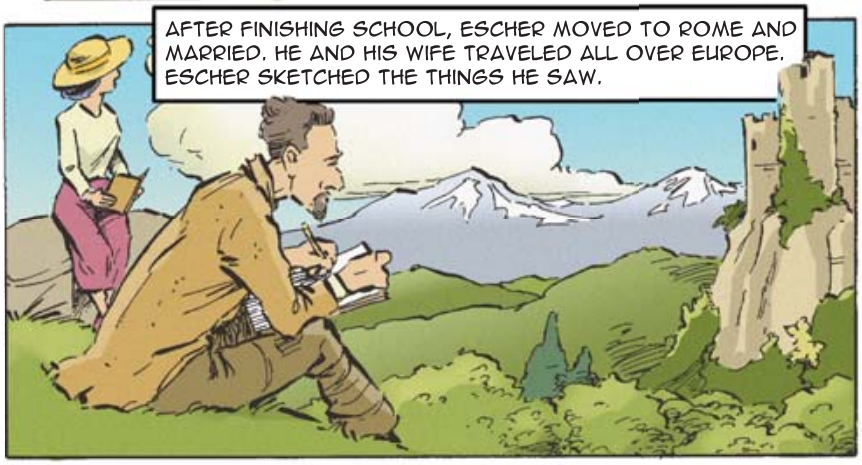
Great Moments in SCIENCE

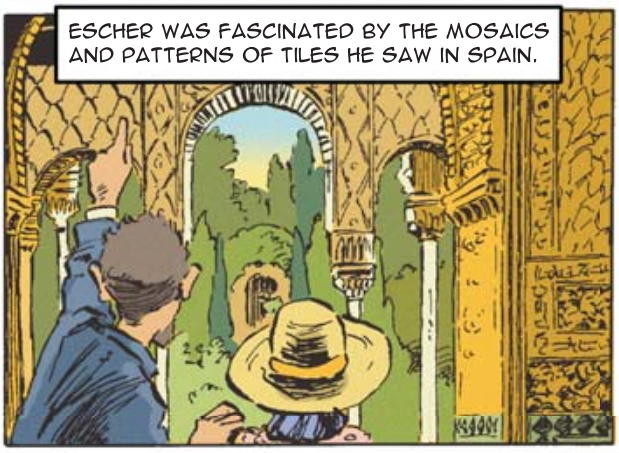
by Bill Slavin

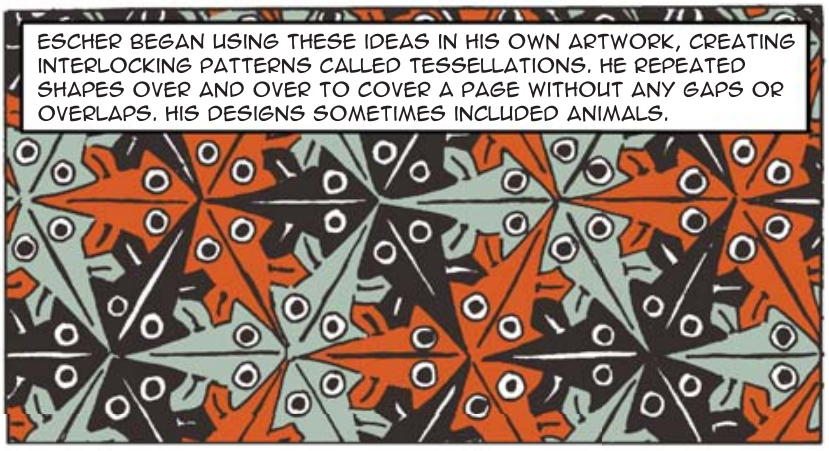
The Mathematical Artist

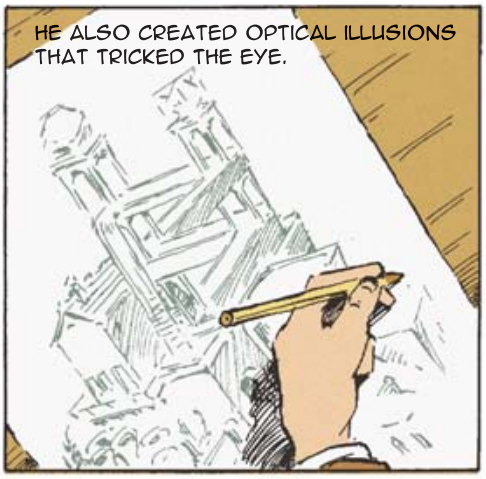


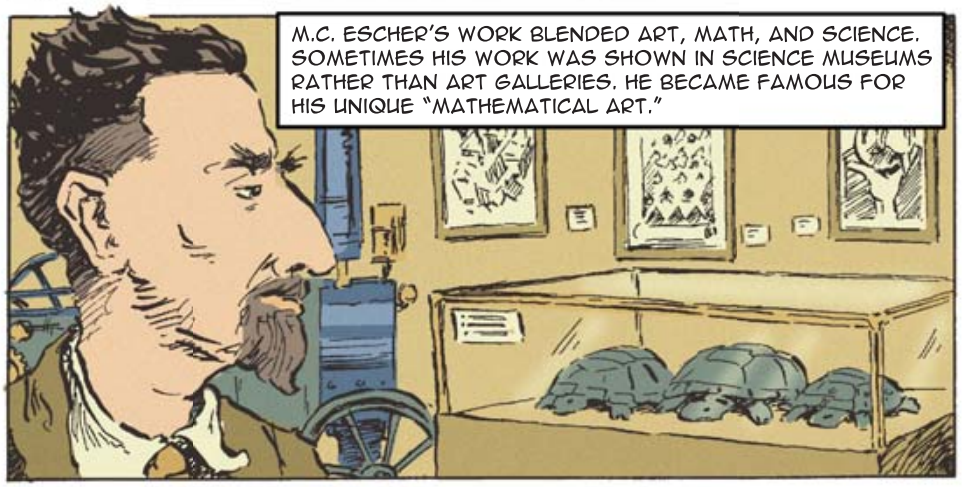












Home Lab

String Art

by the Mad Science Project Team

Math and art often cross paths. Try this activity to see how you can create curves using straight lines.

What you need

- Round dinner plate
- 1 sheet paper
- Pencil
- Scissors
- Sticky tape
- 16 straight pins*
- Corrugated cardboard*
- String, yarn, or embroidery thread

*You can also create your string art board using nails hammered into a piece of wood.

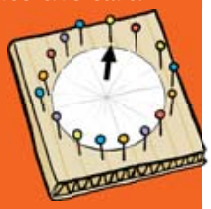
Mike Cope/copetoons.com (5)

What to do

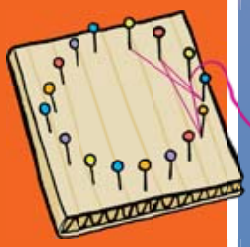
1. Make a circle by placing the plate on the piece of paper. Use the pencil to trace around the edge. Cut the circle out.

2. Fold the circle in half four times. You will end up with a folded shape that looks like a slice of pie.

3. Open the circle and place it on the cardboard. Tape the paper in place. Push a straight pin into the cardboard at each crease in the paper. The pin in the 12 o'clock position is Pin 1. The pin to the right is Pin 2, then Pin 3, and so on. Remove the paper.



4. Tie one end of a piece of string around Pin 1. Wrap the string around Pin 4. Now go back to Pin 2, then to Pin 5. Carry on around the circle in this pattern (3, 6; 4, 7; 5, 8; etc.) Continue until you arrive back at Pin 1. Knot the string and cut off the excess thread.



5. Repeat this process with other colors, but begin at a different pin. Or, you can choose a new pattern (e.g., Pin 1, Pin 6; Pin 2, Pin 7; etc.) beginning on Pin 1.

How it works

By using only straight lines in a repeated pattern, you have created a rounded shape called a Bézier curve. There are many different ways to create art using string and repeated patterns. For more ideas for string art, go to this site:
www.mathcats.com/crafts/stringart.html

CLOSE-UP

This is the foot of a gecko, a kind of lizard. These insect-eating lizards are known for their ability to walk up walls and even across ceilings. The trick to geckos' acrobatics is in their toes. Each toe is covered with about two million fine hairs. And each of these hairs is further divided into a bundle of finer hairs. (This clump of hairs looks a bit like a little tuft of broccoli.)

As the gecko walks, it rolls each hair onto the surface and then peels it off again. All of those hairs give geckos amazing sticking abilities, but they stick and peel quickly as they zip around the room — and overhead!

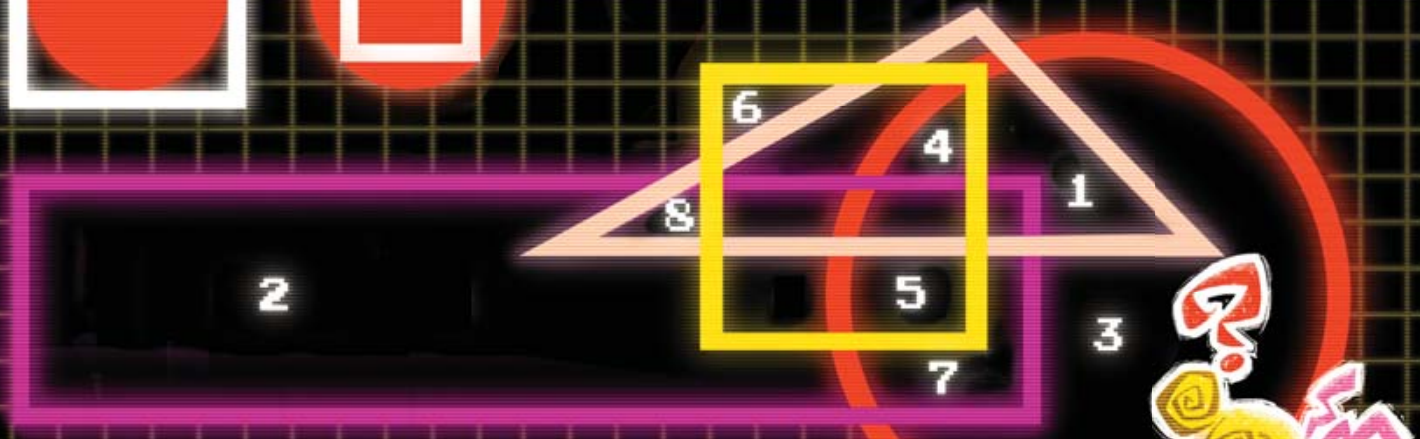
Volker Steger/Science Photo Library

PROGRAMMED BY GLEN MULLALY
ANSWERS ON PAGE 31

ARCADE RAID!

OH NO! WADE AND JADE HAVE BEEN SUCKED INTO AN OLD-FASHIONED VIDEO GAME! HELP THEM GET OUT BY SOLVING THESE 7 GEOMETRIC PUZZLES.

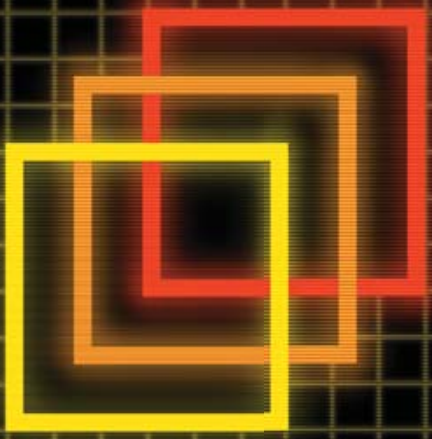
1. IS ONE OF THESE CIRCLES LARGER THAN THE OTHER? ARE YOU SURE?



2. WHAT NUMBERS ARE:

A. IN THE CIRCLE BUT IN NO OTHER SHAPE?
B. IN THE SQUARE BUT NOT IN THE CIRCLE?
C. IN BOTH THE TRIANGLE AND THE RECTANGLE?
D. IN BOTH THE RECTANGLE AND THE CIRCLE BUT NOT THE SQUARE?
E. IN THE SQUARE AND THE CIRCLE AND THE RECTANGLE?
F. IN THE TRIANGLE AND THE CIRCLE ONLY?
G. IN THE CIRCLE AND THE SQUARE, BUT NOT THE RECTANGLE?
H. IN THE RECTANGLE, BUT NOT THE CIRCLE, SQUARE, OR TRIANGLE?

3. HOW MANY SQUARES ARE IN THE IMAGE TO THE RIGHT?



4. CAN YOU WRANGLE YOUR WAY FROM ANY OUTSIDE ENTRANCE TO THE CENTER OF THIS TRIANGLE MAZE WITHOUT GETTING ENTANGLED?

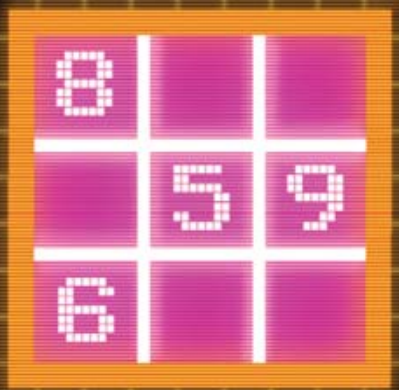
5. USE THE SHAPE WORDS BELOW TO FILL IN THE BLANKS IN THESE THREE SENTENCES. USE EACH WORD ONLY ONCE.

A. AMIR IS THE TEAM'S _____ RUNNER ON THE SCHOOL'S NEW _____ TRACK.

B. JOANNE'S _____ OF FRIENDS WATCHED HER PLAY THE _____ IN THE ORCHESTRA.

C. MEGAN ACCIDENTALLY SCRATCHED HER FAVORITE COMPACT _____ WITH HER _____ RING.

DIAMOND OVAL CIRCLE STAR DISC TRIANGLE



6. FILL IN THE MISSING NUMBERS IN THIS BOX TO MAKE EACH COLUMN, ROW, AND DIAGONAL ADD UP TO 15. EACH NUMBER FROM 1 TO 9 WILL BE USED ONLY ONCE.

7. NOT INCLUDING WADE'S GLASSES, HOW MANY CIRCLES CAN YOU FIND IN THIS PICTURE?

SKY SPIES

BY KEN HEWITT-WHITE

This image of Jupiter was taken by a space probe called *Cassini*. The colored bands are clouds of frozen gases. The pink area shaped like a football is the Great Red Spot, a Jovian storm bigger than Earth!

Courtesy NASA

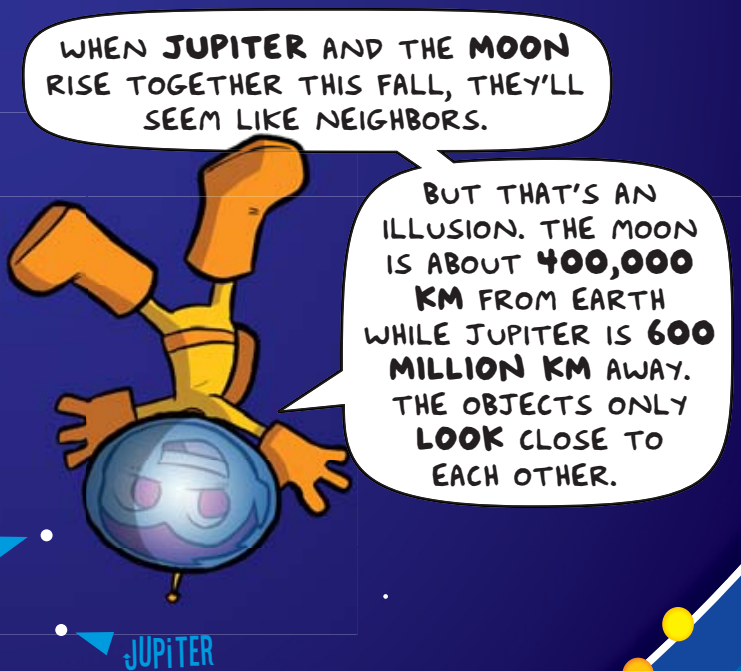
JUPITER, KING OF THE PLANETS

Planets are drifters. They look like stars moving slowly from one constellation to the next in the night sky. Long ago, people believed these "wandering stars" were gods keeping watch over the Earth. One of the wanderers shone with a brilliant, steady light. To the sky watchers of ancient Rome, the heavenly beacon was Jupiter, king of the gods.

Today we know Jupiter is not a supernatural being, nor is it a star. Jupiter is simply the largest planet in our solar system. Jupiter is almost 143,000 kilometers in diameter (the distance across the planet, from one side to the other). This is about 11 times the size of Earth. No wonder "old Jove" appears so bright. At this time of year you can spot it low in the eastern sky on clear nights.

Identifying planets can be tricky. Some constellations contain one or two bright stars that you might mistake for a planet. Fortunately, you won't have that problem with Jupiter this fall. The bright white planet is drifting across the constellations of Pisces and Aquarius, which are quite faint. Jupiter outshines every star in that part of the sky.

If you're still not sure about Jupiter, circle September 22 and October 19 on your calendar. On the evening of September 22, Jupiter will hang directly below the full Moon as it rises in the east. Nearly one month later, on October 19, the Moon and Jupiter will appear in a similar arrangement. If the sky is clear, the Moon will guide you to the king of planets!



Sam Logan

The Moon and Jupiter will appear near each other as they rise in the east on September 22 and again on October 19. The best time to look is around 8 p.m. on the first date and 7 p.m. on the second date.

SEPTEMBER 22
8:00 P.M.

EAST

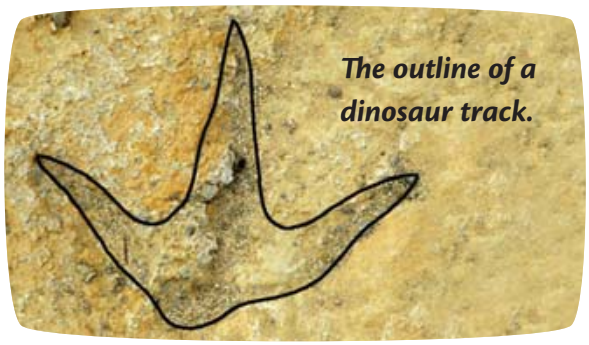
Dinosaur Footprints and Trackways

by Philip Currie and Eva Koppelhus

To a paleontologist who studies dinosaurs, the best thing to find would be a living dinosaur. But in spite of rumors of living monsters in Loch Ness (The Loch Ness Monster), Lake Okanagan (Ogopogo), and elsewhere, it is highly unlikely that we will ever find a living dinosaur. Most of the information we have about dinosaurs comes from their fossilized bones. But dinosaur footprints can tell us a lot, too.

Dinosaur footprints show us what dinosaurs were doing when they were still alive. We can see if the dinosaurs were walking or running when they went across the ancient mud. In many places the footprints — or trackways — show animals walking side by side. This tells us dinosaurs were living together in herds. Some footprint sites even show babies surrounded by adults. The adults were protecting the babies in the herd from meat-eating dinosaurs.

Sometimes the footprints are so well preserved that you can even see impressions of the skin on the bottoms of the feet. Like any living animal, each dinosaur made thousands, maybe millions, of footprints during its lifetime. Sometimes dinosaur trackways are so well preserved it seems like a dinosaur walked across the mud just minutes before!



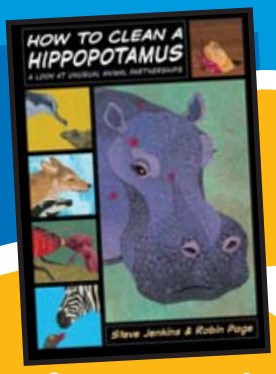
The outline of a dinosaur track.

Philip Currie and Eva Koppelhus

David Parsons

Reviewed by You

You Can Review, Too!
Email or write us if you'd like to write a review for *KNOW*. Please tell us your name, age, and address. Our address is on page 2.



How to Clean a Hippopotamus
A Look at Unusual Animal Partnerships

Author: Robin Page
Illustrator: Steve Jenkins
Publisher: Houghton Mifflin Books
Product: Book (32 pages)
Ages: 7 to 10

Giraffes and oxpeckers, coyotes and badgers, tuataras and petrels. This book explores how animals help one another. The pages begin with questions such as, Why does a giraffe let an oxpecker climb into its ear? (Just in case you're wondering, it's to eat ticks and other parasites.) The book is beautifully illustrated with Steve Jenkins' colorful collages. Two pages at the end of the book describe the animals in more detail and provide more information on these partnerships.

Reviewer: Joshua Lumia, age 8

I thought this book looked inviting to read because the title sounded funny and interesting. There were also colorful pictures of animals on the cover. I learned about lots of different animal partnerships like the coyote and the badger teaming up. They work together to trap prairie dogs. I really liked the pictures because they were unusual and cool. I had fun reading the book because I learned lots of stuff I didn't know before. Fantastic is the word I would use to describe this book.

Lucky 13
Survival in Space

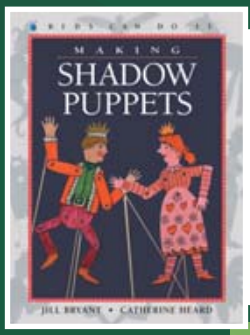
Author/Illustrator: Richard Hilliard
Publisher: Boyds Mills Press
Product: Book (32 pages)
Ages: 9 to 11

On April 11, 1970, three astronauts left Earth on *Apollo 13*. Their destination was the Moon where their mission was to explore the surface. As they neared the Moon, however, a powerful explosion rocked *Apollo 13*. The spacecraft lost power and oxygen. The astronauts radioed Mission Control, "Houston, we have a problem." This book describes this event, one of the world's great stories of survival.

Reviewer: Seth Stere, age 7

It was cool to hear how the astronauts used the Moon's gravity to get back to Earth and how one astronaut had to do the math calculations in his head. It was very interesting to learn how the spacecraft was able to break into different parts and how some of these parts stayed up in space. I think it would have been more exciting if the astronauts told the story. I wanted to hear more about what they were thinking and what they went through.

COMIC CAPTIONS



Congratulations! Along with a *KNOW* t-shirt, winners from this issue will receive the book *Making Shadow Puppets* from Kids Can Press.

"**Hey! Stop hogging all the water!**" Ethan B., age 8 (Vancouver, BC)

"**Hey, this water is good.**" Gavin R., age 7 (Enfield, NS)

"**If there are any crocodiles in here, I'm getting out!**" Josie B., age 6 (Toronto, ON)

"**Hey! What's this floating in my water?**" Kennedy C., age 7 (Calgary, AB)

"**Hey dudes, I think there might be fish in here!**" Jamie K., age 6 (Lillooet, BC)

"**Hey! That's my place!**" Victor-Marco G., age 7 (Montreal, QC)

John Pitcher

"**Ice cold water... cool!**" Michael N., age 6 (Whitby, ON)

"**Tell me again why our reflections have stripes.**" Sophie F. (Orono, ON)

"**Ma, my nose is already clean.**" Connor

"**Hey, I can see myself.**" Joseph T., age 9 (Thunder Bay, ON)

1st zebra: "**Slurp, slurp.**"
2nd zebra: "**Bongo, it's not polite to slurp!!**"
3rd zebra: "**Yeah, Bongo, don't slurp your morning tea.**" Lucy C., age 8 (Victoria, BC)

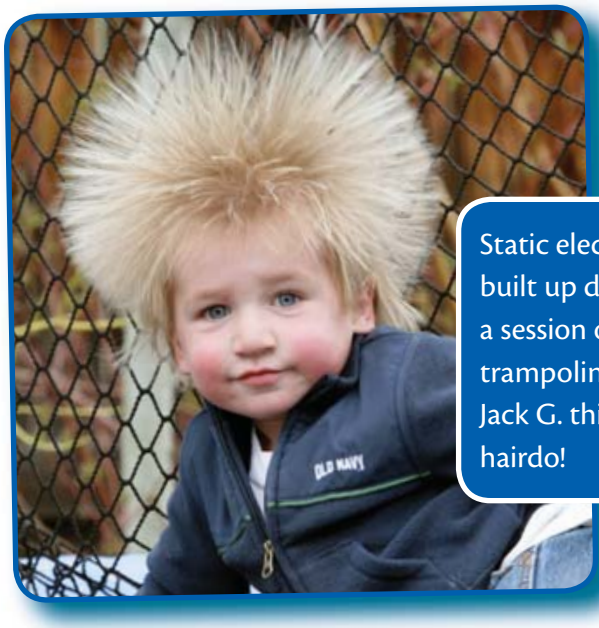
"**I hate sharing my cup.**" Emre Y.V., age 11 (Saint-Sauveur, QC)

John Pitcher

Congratulations to this issue's winners: Josie B., Joseph T., Kennedy C., and Gavin R. **Come up with a caption for the photo on the right and send it to us by November 1, 2010.** (Send your caption, name, age, address, and t-shirt size to the address on page 2 or by email to contests@knowmag.ca.) We will print some of the captions in our Jan/Feb issue, and all who enter will be in a draw to win a book and t-shirt!

KNOW AND TELL

Grab your paints, pastels, and pencil crayons. These are your pages! You can send us your artwork, poems, letters, and photos. We wish we could print them all, but we just won't have the space. Everyone who sends us something will get a chance to win a KNOW t-shirt, though. Include your full name, age, address, and t-shirt size on your entry.



Static electricity built up during a session on the trampoline gave Jack G. this wild hairdo!

Tao L., age 6

Mikayla S., age 9

Lena R., age 11

"Lizard on a Leaf"

Sawyer K., age 8

If you could design a superhero, what skills would make them super? Could they fly like a bird, swim like a fish, "sproing" like a grasshopper? Send us pictures of a superhero that you've designed by November 1, 2010.

Make sure you let us know about their special powers!

KNOW MAGAZINE, 501-3960 QUADRA ST, VICTORIA, BC V8X 4A3

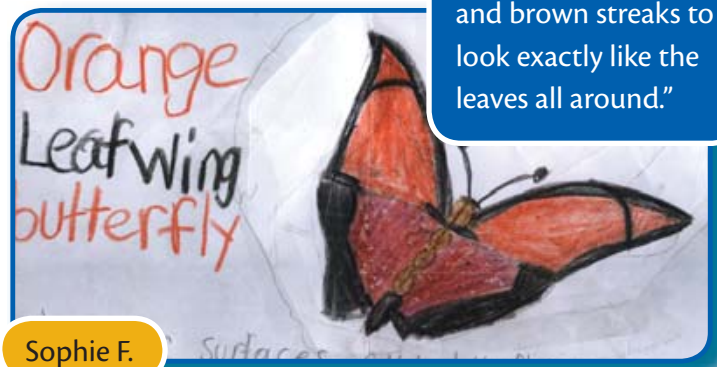
CONGRATULATIONS TO THIS MONTH'S WINNERS!

Neroli L., Hope B., Lena R., and Sawyer K.

Brodie H., age 6

The Monster of the Lake!

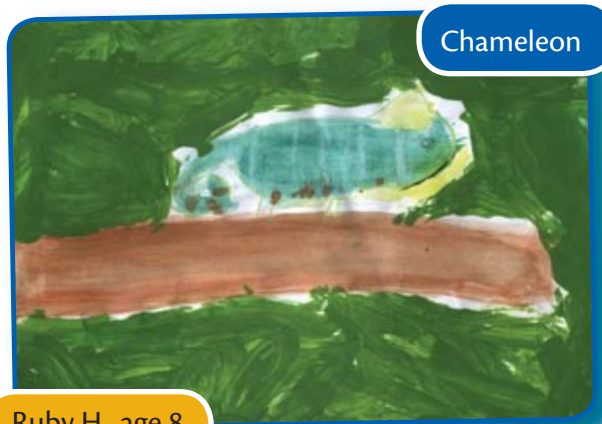
"The upper surfaces of this butterfly's wings are brilliantly colored with glowing orange and pink. But when it lands and closes its wings above its back, only the lower surfaces can be seen. These are marked with green and brown streaks to look exactly like the leaves all around."



Sophie F.

Olivia S., age 9

Dylan S., age 6



Chameleon

Ruby H., age 8

THIS ISSUE'S ANSWERS

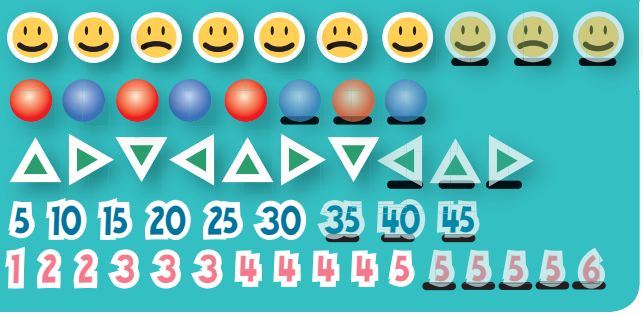
Page 5 — Mind Games

1. Pencil, 2. Lunch, 3. Notebook, 4. Eraser, 5. Crayons

Page 11 — Go, Euler's Formula

6 faces + 8 corners - 12 edges = 2

Page 15 — Find the Patterns



Page 24 — KNOW Fun

1. They are both the same size!

2. A=3, B=6, C=8, D=7, E=5, F=1, G=4, H=2

3. 8

5. a.) Amir is the team's STAR runner on the school's new OVAL track.

b.) Joanne's CIRCLE of friends watched her play the TRIANGLE in the orchestra.

c.) Megan accidentally scratched her favorite compact DISC with her DIAMOND ring.

7. 11

Mad SCIENCE®

Sparking Imaginative Learning After School!

HOW MANY FLOWERS DO BEES NEED TO VISIT IN ORDER TO MAKE 1 POUND OF HONEY?

A) 2 HUNDRED
B) 2 THOUSAND
C) 2 MILLION
D) 20 MILLION

Scientists calculated that bees need to visit over 2 million flowers and travel about 2 times the circumference of the Earth to make one pound of honey!

Looking for innovative ways to interest kids in science? Then Mad Science After-School programs are for you!

Biology is just one of the areas of science we cover in our numerous hands-on, inquiry based and curriculum correlated after-school programs.

Our experiments and activities are designed to educate and entertain!

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www.madscience.org

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